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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/716,621	11/20/2003	Kiyoshi Morimoto	63979-036	6335
7590 07/19/2005 McDERMOTT, WILL & EMERY 600 13th Street, N.W. Washington, DC 20005-3096			EXAMINER WILSON, CHRISTIAN D	
			ART UNIT	PAPER NUMBER
			2891.	

DATE MAILED: 07/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/716,621	Applicant(s) MORIMOTO ET AL. 	
	Examiner Christian Wilson	Art Unit 2891	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 12 May 2005.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) 19-28 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6, 8, 9 and 12-15 is/are rejected.
- 7) ☒ Claim(s) 7, 10, 11 and 16-18 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>04292005.03222004</u> | 6) <input checked="" type="checkbox"/> Other: <u>search history</u>                     |

## DETAILED ACTION

### *Election/Restrictions*

1. Applicant's election without traverse of claims 1 – 18 in the reply filed on May 12, 2005 is acknowledged.
2. Claims 19 – 28 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on May 12, 2005.

### *Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 4 – 6, 8, 13, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moore.

Moore (US 2003/0027416) teaches a non-volatile memory comprising a first electrode 48, a second electrode 52, and a phase-change recording medium 50 sandwiched between the electrodes with a variable resistance due to an electrical impulse [0003], where the phase-change recording medium is a chalcogenide [0027]. Moore teaches an metal bit line comprising rhodium (Rh) [0024], but teaches an electrode comprising metal alloys but not specifically one comprising a Rh alloy. It would have been obvious to one of ordinary skill in the art to use the

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Rh alloy of the metal bit line in one of the electrodes since this would be substituting a known equivalent material for the same purpose as described by Moore [0024, 0026].

Regarding claim 4, Moore further teaches an insulating layer 78 between the first and second electrodes with a through-hole [0030] where the phase-change material 85 fills the through-hole.

Regarding claims 5, 6, and 13, Moore further teaches a straight tube shape sandwiched between the insulating layer and the first and second electrodes in a substantially perpendicular direction [Figure 8].

Regarding claims 8 and 14, Moore further teaches a metal oxide layer [0024].

5. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moore as applied to claim 1 above, and further in view of Lane.

Moore teaches the limitations of claim 1 as described above including a Rh electrode material, but does not discuss a ruthenium (Ru) electrode material. Lane (US 6,475,911) teaches both a Rh electrode material and a Ru and RuO<sub>2</sub> (ruthenium oxide) electrode material [column 1, lines 20-30]. It would have been obvious to one of ordinary skill in the art to use Ru in the device of Moore since Lane teaches that these materials are physically and chemically similar and are stable and easily form conductive oxides useful in forming electrodes.

6. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moore and Lane as applied to claim 2 above, and further in view of Van Brocklin *et al.*

Moore as modified by Lane teaches the limitations of claim 2 above, including a Ge<sub>x</sub>A<sub>y</sub> chalcogenide material for the phase-change material where A is Se, Te, or S or mixtures of the same [0027]. Moore does not specifically discuss GeSbTe. Van Brocklin *et al.* (US 6,917,532)

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teaches GeSbTe as a specific chalcogenide phase-change material [column 7, lines 40-45]. It would have been obvious to one of ordinary skill in the art to use GeSbTe in the device of Moore since Van Brocklin *et al.* teaches that this material provides a suitable substitute for GeTe in read/writeable memories.

7. Claims 9 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moore as applied to claims 8 and 14 above, and further in view of Saito.

Moore teaches the limitations of claims 8 and 14 as described above but does not discuss the roughness of the metal oxide layer. Saito (US 2003/0045736) teaches a rough RuO<sub>2</sub> film. It would have been obvious to one of ordinary skill in the art to use the film of Saito in the device of Moore since Saito teaches that the disclosed rough RuO<sub>2</sub> film was a good film for an electrode layer [0057, 0008].

8. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moore as applied to claim 8 above, and further in view of Lee *et al.*

Moore teaches the limitations of claim 8 as described above but does not discuss the structure of the metal oxide film. Lee *et al.* (US 2001/0034116) teaches a RuO<sub>2</sub> layer with a tetragonal rutile structures [0031]. It would have been obvious to one of ordinary skill in the art to use the structure of Lee *et al.* in the device of Moore since Lee *et al.* teaches that this structure is electrically conductive and stable to heat and chemicals.

***Allowable Subject Matter***

9. Claims 7, 10, 11, 16, 17 and 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

10. The following is a statement of reasons for the indication of allowable subject matter: applicant claims in claims 7 and 18, in the context of the entire claim, an insulating tube formed along the inner surface of the through-hole that has a lower thermal conductivity than that of the insulating layer. In claims 10 and 16, applicant claims an average roughness of not smaller than 10 nm and not greater than 100 nm. In claims 11 and 17, applicant claims a multi-layered metal oxide where the first conductive oxide has a small average grain size and a second conductive oxide film that has a larger average grain size.

***Conclusion***

11. A copy of the search history is enclosed.

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Xu *et al.* (US 2003/0073262) teaches a phase-change memory with an insulating liner in the through-hole but does not discuss the thermal conductivities of the insulating materials. Joo *et al.* (US 2003/0011013) teaches metal layers with varied grain sizes in a capacitor structure.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christian Wilson whose telephone number is (571) 272-1886.

The examiner can normally be reached on weekdays, 7:30 AM to 4 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Baumeister can be reached on (571) 272-1722. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Christian Wilson, Ph.D.  
Primary Examiner  
Art Unit 2891

CDW